COUPLING DEVICE AND AGRICULTURAL MACHINE COMPRISING SUCH A DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a coupling device for an agricultural machine, in particular a mower, comprising a coupling support that can be mounted on a three-point hitch of a tractor and at least one arm articulated to the coupling support and protruding from the coupling support in a direction parallel to the direction of advance of the tractor, said arm carrying, in an articulated manner, a chassis provided to carry a work element.

2. Description of the Related Art

On a coupling device of this type known from document GB 2 013 466 A, the arm is surmounted by a connecting-rod articulated to the coupling support and the chassis. Thus, the coupling-rod and the arm form, projected in a vertical plane parallel to the direction of advance, a deformable quadrilateral. During work, the work element moves over the ground. The unevennesses thereof cause the chassis carrying the work element to move, at least vertically, in order to follow the contour of the terrain on which the agricultural machine is moving. In particular in the case of a mower, the work element, for example comprising discs or cutting drums, forms an angle relative to the ground called cutting angle. During work, this angle may be close to zero in particular with cutting drums, i.e., the latter rotate in a plane substantially parallel to the ground. However, with cutting discs, the front part thereof is slightly lower than their rear part. This is referred to as a positive cutting angle. In locations where the ground has hollows, the work element and, subsequently, the chassis move downward relative to the coupling support. The cutting angle then evolves such that the front part of the work element is significantly lower than its rear part. This allows the work element to effectively cut plants in the hollow locations of the terrain. Conversely, when the work element encounters a bump and is required to lift up, the cutting angle evolves such that the front part of the work element is higher than its rear part. The cutting angle is then negative. This allows the work element to slide over the obstacle without being damaged and without dirtying the cut plants with soil.

In order to guarantee a good work quality on terrain with a very uneven profile, it is desirable for the coupling device to allow the work element to move vertically with a great amplitude. On the known coupling device, the connecting-rod and the arm have similar lengths and therefore form a quadrilateral close to a parallelogram. In that case, the cutting angle changes little between the highest position of the work element relative to the coupling support, and its lowest position relative to the latter. The variation law of the cutting angle is then determined so as to prioritize rather the positive cutting angle values or the negative values. With a cutting angle evolving rather in the positive values, the work quality will be deteriorated on bumps, in which the work element will tend to become embedded. Conversely, a cutting angle oriented toward the negative values will deteriorate the work quality in the hollows. The connecting-rod and the arm could also have very different lengths. The connecting-rod could in particular be substantially shorter than the arm. Such a geometry would allow the cutting angle to evolve between two extreme values very distant from each other, such that the work element has an optimal inclination on significant bumps or in significant hollows.

During vertical movements of the work element, the articulation between the chassis and the connecting-rod follows a circular path relative to the coupling support. In fact, the cutting angle evolves more or less linearly with regard to the height of the work element relative to the coupling support. As a result, the upper coupling-rod cannot control the movements of the chassis so that the work element always has an optimal inclination, irrespective of the contour of the terrain. Furthermore, on the known coupling device, it is necessary for the coupling-rod and the arm to have a reduced length in order to preserve a reduced bulk for the coupling device in the direction of advance. In order nevertheless to ensure a significant vertical movement amplitude of the work element, the connecting-rod and the arm are then caused to take on a large angle. However, all of the forces exerted on the work element are collected by the connecting-rod and the arm. As a result, the articulations of the latter with the chassis and the coupling support undergo significant stresses.

Another coupling device of an agricultural machine is known from document EP 1 593 294 A1. This document describes a front mower comprising a coupling support to which an arm is articulated. The latter protrudes from the coupling support in the direction of advance. At its front end, the arm carries two connecting-rods extending backward toward the tractor and connected to a chassis carrying a work element. A modification of the length of these connecting-rods causes a significant modification in the length of the machine and/or in the position of the chassis relative to the coupling support. The mass distribution of the machine is noticeably affected, which has harmful effects on following the terrain and/or on the resistance of the various articulations. Additionally, it is difficult to modify the position of the articulation points of the connecting-rods on the chassis in significant proportions, given the immediate proximity of the work elements and the associated driving elements. With such a machine, the designer is faced with difficulties when he wishes to modify the variation law of the cutting angle, because the geometric possibilities allowing it are limited by the bulk and mass distribution constraints.

BRIEF SUMMARY OF THE INVENTION

The present invention aims to propose a coupling device for an agricultural machine that does not have the aforementioned drawbacks. This device in particular makes it possible to obtain a good adaptation to the contour of the terrain and to control the work element to obtain a good work quality.

To that end, an important feature of the invention lies in the fact that the coupling device additionally comprises an upper connecting-rod, a lower connecting-rod and a central connecting-rod, that each of the upper connecting-rod and lower connecting-rod is articulated to the coupling support and the central connecting-rod so as to form, projected in a vertical plane parallel to the direction of advance, a deformable quadrilateral, and that the central connecting-rod is articulated to the chassis.

This design allows the cutting angle to evolve between a negative extreme value and a positive extreme value that are significantly distant from each other. Thus, the coupling device guarantees that the work element always has an optimal inclination relative to the terrain, on significant bumps or in significant hollows, and in any intermediate vertical position. Furthermore, the cutting angle may evolve nonlinearly with regard to the height of the work element relative to the coupling support. The coupling device according to the invention therefore allows fine control of the cutting angle. Additionally, the designer of such a coupling device has great freedom to obtain the desired variation law of the cutting angle, since for the most part it suffices to change the length